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Digital Business Engineering: *Methodological Foundations and First Experiences from the Field*

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Abstract

Digitization is affecting almost all areas of business and society. It brings about opportunities for enterprises to design a digital business model. While a significant amount of research exist examining the conceptual foundation of business models in general, no comprehensive approach is available that helps enterprises in designing a digital business model. This paper addresses this gap and proposes Digital Business Engineering as a method for digital business model design. The activities are structured into six phases, namely End-to-End Customer Design, Business Ecosystem Design, Digital Product/Service Design, Digital Capability Design, Data Mapping, and Digital Technology Architecture Design. The method development follows principles of design-oriented research. Five case studies are used to analyse method requirements and evaluate it within is natural context.

Keywords: Digitization, Business Model; Digital Business Engineering, Method Engineering, Case Study

1 Introduction

1.1 Research Motivation

Digital Business is a term that has recently created much attention both in the scientific and in the practitioners' community. Driven by native digital companies such as Facebook and Google as well as by start-up businesses such as MyTaxi, MyDryClean, and Uber and many enterprises see themselves confronted with questions for future revenue streams, customer segments, new market entrants and innovative operational models.

Along with the proliferation of digital businesses, both researchers and practitioners are frequently discussing the concept of business models. Consensus exists with regard to the question as to what a business model is (Alt and Zimmermann 2001; Hedman and Kalling 2003; Zott et al. 2010). Apart from that, there is a significant amount of contributions on electronic business models (Osterwalder and Pigneur 2002; Timmers 1999; Gordijn et al. 2000). Furthermore, some contributions address the task of business modelling. A prominent technique supporting this task is the so-called Business Model Canvas (Osterwalder and Pigneur 2010). Another approach that gained significant attention both among practitioners and researchers is Business Engineering (Österle 1996; Österle and Winter 2003) providing methodological support when it comes to business transformation induced by information technology (IT).

However, the design of a digital business model is still relatively unexplored. The research community proposes first approaches for particular questions in the design of a digital business model. Otto and Aier (2013), for example, examine business models in the data economy. Krishnan et al. (2007) study business models of peer-to-peer networks. A comprehensive approach, though, is not available yet. Furthermore, a study conducted by consulting company McKinsey finds that barriers to digital business models include management, organizational, and technical aspects ranging from lacks of expertise to poor data quality, for example (Brown and Sikes 2012).

It is this gap in the understanding of how to design digital business models which motivates the research presented in this paper.

1.2 Research Goal

This research aims at methodological support for designing digital business models. The paper proposes Digital Business Engineering as a comprehensive methodological framework. The paper takes a design-oriented approach to the object of investigation. It wants to understand the underlying means-end principles of digital business model design, rather than corresponding cause-effect relationships (Winter 2008). Five case studies are used to analyse method requirements and evaluate it within is natural context.

From an epistemological perspective, the paper is positioned in the design-theoretical (cf. Gregor 2006) realm, i.e. it aims at contributing to the scientific knowledge base while at the same time being useful for practical application. The contribution to the scientific knowledge base stems mainly from the methodological foundations of the Digital Business Engineering approach. Practitioners may benefit from the results as the method fragments help structuring and accelerating digital business modelling activities in enterprises. In particular the six phases in which the activities of the method are structured give guidance to digital business modelling efforts in practice.

The remainder of the paper starts with a presentation of related work, which also introduces the basic conceptualisation of the research. The third section lays out the research approach, before section 4 presents the method itself. Selected method components are presented as they are used in the corresponding case studies. Section 5 summarizes and interprets the findings that result from the case studies. The paper closes with a conclusion section.

2 Related Work

2.1 Business Model Research

Business model research is rooted in the resource-based view (RBV) of an enterprise. Scholars from management science introduced RBV to the academic discourse, for example Barney (1991). RBV proposes that competitive advantage originates from strategic enterprise resources. Strategic resources meet the so-called VRIN criteria, i.e. they are valuable, rare, inimitable and non-substitutable (Dierickx and Cool 1989). RBV as an exploratory model for competitive advantage gained significant attention in the late 1980s and early 1990s not only on the scientific community, but also among practitioners, mainly driven by contributions such as the book on competitive advantage by Porter (1985).

However, resources themselves are not able to create value (Bowman and Ambrosini 2000). The creation of value is brought about by competencies, which are portrayed as the ability to deploy combinations of firm-specific resources to accomplish a given task (Teece et al. 1997). In this context, an organizational capability is the "ability of an organization to perform, across individuals or groups, a coordinated set of tasks, utilizing organizational resources, i.e. tangible or intangible assets and inputs for production, for the purpose of achieving a particular end result" (Helfat and Peteraf 2003). In addition to explicit elements such as methods and functions, capabilities also comprise tacit elements, such as knowledge of individuals or leadership.

Of course, RBV is only one conceptualization of business models. Competing views see business models as activity systems (e.g. Zott and Amit 2010) or even ingrained strategic orientations (e.g. Aspara et al. 2010). However, the paper follows the RBV perspective on business models, mainly because it views the activity of business modelling as an organizational capability.

2.2 Digital Business Models

The term "digital business" is experiencing a renaissance at present. While it was initially coined in the 1990s, it is today used in broader context. The traditional understanding of digital business was very much influenced by the debate around treating information as an enterprise asset (Horne 1995; Oppenheim et al. 2001). This perspective on digital information acknowledged the important role that information plays for enterprise success. However, it mainly materialised in the digitization, often "electronification", of business processes. Today's notion of digital business, though, takes a business model view looking at the enterprise as a whole and asking what opportunities digitization brings about to transform and advance current business models.

Research groups embracing this perception of the term "digital business" have formed across the globe. Examples are the MIT Center for Digital Business (The MIT Center for Digital Business 2015) and the research programme "Digital Business Transformation" at the University of St. Gallen (Leimeister et al. 2014b). Furthermore, the European Commission published recommendations for the transition to the data-driven economy (European Commission 2014).

The practitioners' community is discussing the fundamental principles of digital business models, too, and came up with first recommendations. In Germany, for example, the Smart Service Welt Working Group (2014), which consists of delegates from industrial partners, research as well as policy makers, investigates business models around so-called smart services. One fundamental design principle of such services is consumer-centricity (Leimeister et al. 2014a) and, closely related to that, multi-channel integration. The term consumer-centricity looks at the individualization trend from a business perspective.

Furthermore, companies reach out to their customers via many channels, not just the direct sales channel, and keep track of one unique customer identity across those channels. Another indication for the increased focus on the consumer is the involvement of customers in the value creation process, for example through crowdsourcing, which changes the consumer role into a "prosumer" (Ernst & Young 2011).

In the digital economy, products are evolving into "hybrid service offerings". Traditional products become increasingly computerized and "smart" thanks to the close integration of IT into physical products. Examples are embedded software systems in modern cars ("Car IT") and "wearables", clothes with integrated computer chips. Companies try to gain more from additional services around the core product (Yoo et al. 2010).

While some research exists on digital business models, the practitioners' community is experiencing a number of drawbacks in leveraging the full potentials of digitisation. A McKinsey study points to various barriers among which are inappropriate organisational structures, lack of IT systems, lack of IT and business expertise, lack of leadership and poor data quality (Brown and Sikes 2012). Apparently, there is a need for methodological support when it comes to digital business.

2.3 Business Modelling Methodologies

Business models are of conceptual nature. Thus, many proposals about the constituents of a business model are presented as conceptual models (cf. Hedman and Kalling 2003). The process of creating such a conceptual model is referred to as business model design and follows the general principles of model design.

Early research on business model design stems from the 1990s. Business Engineering, for example, is a model-oriented and method-driven approach for managing IT-induced transformation (Österle 1996; Österle and Winter 2003). It integrates different views of an enterprise, mainly business strategy, business processes, and information systems and can be operationalised using a set of individual methods.

Later on, the research community proposed further methods, which often focused on a particular aspect of a business model. MacInnes and Hwang (2003), for example, focussed on peer-to-peer business models, Timmers (1999) and also Alt and Zimmermann (2001) examined business models of electronic markets, and Wirtz et al. (2010) provided guidance for internet business models using Web 2.0 ideas.

Apart from that, De Vos and Haaker (2008) discuss how to apply the STOF business modelling method in practical steps, and Heikkilä and Heikkilä (2013) suggest a practical approach to use their C-SOFT business modelling method in action design research. There are also some methods that focus on specific elements of business model design and evaluation, e.g. the business model roadmapping method by De Reuver et al. (2013).

Recently, the Business Model Canvas proposed by Osterwalder and Pigneur (2010) gain much attention in the scientific community, but even more among practitioners. Similarly, Gassmann et al. (2013) propose a set of practical business model blueprints.

Some initial work is available for developing digital business models (Berman 2012; Bharadwaj et al. 2013; Eichentopf et al. 2011). However, a comprehensive approach that covers all the various concepts of digital business models is not available yet.

3 Research Design

3.1 Research Process

The paper aims at designing a method to guide the process of digital business modelling. In general, methods are typical design artefacts (March and Smith 1995; Hevner et al. 2004) as they embody the scientific knowledge about means-end relationships for a phenomenon under investigation. Thus, the design of the Digital Business Engineering method follows Design Science Research (DSR) principles.

Consortium Research Phase	Activities/Methods
Analysis	Expert interviews Focus group workshops Case study research Analysis of literature in the scientific and practitioners' domain
Design	Business Engineering as a conceptual foundation Method Engineering as a design paradigm Participative case studies
Evaluation	Expert interviews Case studies
Diffusion	Presentation at practitioners' conferences Present research paper

Table 1: Consortium Research Approach

Over the last decade, a number of guidelines emerged supporting the DSR process. A prominent example is the Design Science Research Methodology proposed by Peffers et al. (2007). The majority of approaches has in common that a DSR process is iterative in nature and combines both scientific and practitioners' knowledge during the artefact design. As in particular the latter is of paramount importance to achieve both scientific knowledge accumulation and practical utility, the paper follows consortium research as a methodological frame. Consortium research is a multilateral form of DSR in which researchers work closely with practitioners over a significant amount of time. Practitioners contribute their knowledge and test the design artefacts regularly within their organisational environments (Österle and Otto 2010). Consortium research consists of four phases, namely analysis, design, evaluation, and diffusion. The cycle itself is conducted repeatedly and typically, researchers perform multiple iterations within the four phases.

As Table 1 shows, key to the research process, in particular for data collection, are case studies and expert interviews for analysis and evaluation purposes. Furthermore, Method Engineering forms the conceptual foundation for the method design.

3.2 Data Collection

The design of the Digital Business Engineering method requires data from the field for requirements specification and artefact evaluation purposes. Data was collected via two research methods, namely case studies and expert interviews.

Case study research is adequate when a relatively new phenomenon is investigated that cannot be separated from its organizational environment (Yin 2014) - as in the case of Digital Business Engineering. The case studies used various data sources as input, such as interviews with company representatives, internal and external documentation and material.

Case	Industry	Country	Period of Data Collection	Type of Case Study	Key Experts	Other Material
A	FMCG	DE	02/2012-10/2012 7 interviews of 4 hours	participative	Head of Supply Chain Data Managemen t, PM Digital Marketing	Presentation on industry event
B	Retail	CH	12/2010-12/2013 3 interviews of 2 to 3 hours	explorative	Head of Customer Intelligence, PM Web Intelligence	Two presentations at industry events
C	Online Fashion Retail	DE	12/2012-09/2014 2 interviews of 2 hours	explorative	Head of BI	Presentation on industry event
D	Insurance	CH	09/2014-01/2015 10 interviews of at least 2 hours	participative	Head of Innovation, PM Marketing	Internal documents
E	Power Tools	LI	01/2013-06/2014 2 interviews of 2 hours each	explorative	Digital Business Project Leader	Presentation on industry event

Table 2: Case Study Overview

Table 2 shows key information about the five cases in this paper. The companies analysed in the case studies were members of the industry network of the Competence Center Corporate Data Quality (CC CDQ). The CC CDQ is a consortium research project aiming at the advancement of quality-oriented data management in large enterprises (Otto and Österle 2010). Two of the authors of the paper are part of the team of CC CDQ which forms the context of the study presented in this research. Companies in Cases A and B were regular consortium partners of the CC CDQ, the remaining companies were well-known companies from the wider project network.

Cases A and D were participative, i.e. the researchers did actively engage with the case study company and did not limit their role to a purely observing one. Baskerville (1997) points to the difficulties that occur as a consequence of research participation in action research cases. However, case study research with a strong active part on the researchers' side is more and more seen as useful in DSR settings, as the proposition and adoption of methods such as Action Design Research (ADR) shows (Sein et al. 2011).Apart from that, expert interviews were conducted to triangulate findings. The expert interviews were design as focus groups in order to leverage consensus-finding mechanisms that come with group set-ups (Chiarini Tremblay et al. 2010; Stewart et al. 2007). Table 3 shows the focus groups that were conducted within the research endeavour presented in this paper. The participants in the focus groups were delegates of the CC CDQ partner companies, i.e. mainly line and project managers responsible for enterprise-wide data and digitization activities. The fact that focus group participants only in some cases also were included in on-site case study interviews contributed to the triangulation objective.

The focus group workshops started with an impulse presentation by the research team, an invited company presentation on the focus topic (with exception of the session on October 10th, 2013), and a moderated discussion.

Date	Time	Location	Focus Topics	Participants
2012-06-14	09.00-16.00 h	St. Gallen (CH)	Consumer-centric information management, Consumer services, Product information	16 participants from 10 companies
2013-09-24	09.00-17.00 h	St. Gallen (CH)	Consumer-centricity, Consumer services, Value of data	16 participants from 14 companies
2013-10-10	10.00-11.00 h	St. Gallen (CH)	Business in the data-driven economy	46 participants from 23 companies
2014-04-30	09.00-12.00 h	Munich (DE)	Capabilities for Big Data management	9 participants from 6 companies
2014-06-26	09.00-10.30 h	Stockholm (SE)	Towards the data-driven organization, business opportunities and needs for action, organizational capabilities	41 participants from 15 companies
2014-12-11	08.45-12.15 h	Berlin (DE)	Capabilities for Big Data management	10 participants from 7 companies

Table 3: Focus Group Overview

3.3 Method Engineering

While Business Engineering forms the conceptual framework of the method, Method Engineering is used as a concrete design technique. Method Engineering stems from the software engineering domain and services the design of methods through the definition of method components and their relationships (Heym 1993; Nuseibeh et al. 1996). Methods give guidance for design and development processes by providing recommendations on the activities and techniques needed to achieve a certain result type (Brinkkemper 1996).

Gutzwiler (1994) identifies five components which constitute a method according to Method Engineering. First, a meta-model identifies and describes the relevant concepts (and their relationships) for the application domain of the method (Digital Business Engineering, in the case of this research). Second, result types describe the various outcomes of applying the method. Third, activities describe which steps must be carried out in order to achieve the result types. Fourth, roles are defined which perform the activities. Fifth, techniques are defined which have to be deployed within the activities.

4 A Method for Digital Business Engineering

4.1 Requirements and Method Overview

Two sources of knowledge led to the requirements of Digital Business Engineering, namely analysis of literature and findings from the field. Table 4 summarises the functional method requirements. Besides, there are non-functional requirements which mainly stem from good modelling practice (such as usability, technical comprehensiveness etc.). However, these requirements are addressed implicitly by following a widely adopted modelling approach such as Method Engineering.

Req.	Description	Supporting Literature	Case A	Case B	Case C	Case D
R1	Comprehensive enterprise perspective	(Bharadwaj et al. 2013), (Brown and Sikes 2012)	X	X		X
R2	Consumer-centric perspective	(Ernst & Young 2011), (Leitner and Grechenig 2008), (Rajagopal and Burnkrant 2009), (Ross 2009), (Schuster and Dufek 2004)	X	X	X	X
R3	Digital product/service perspective	(Leimeister et al. 2014a), (Rajagopal and Burnkrant 2009)	X			X
R4	Data-centric perspective	(European Commission 2014), (Newman 2011), (Otto et al. 2014), (Otto and Aier 2013)	X	X	X	
R5	Organisational capability perspective	(Berman 2012), (Yoo et al. 2010)	X			X
R6	Business ecosystem perspective	(El Sawy and Pereira 2013), (Corallo et al. 2007)	X			X
Legend: X - Requirement addressed in Case.						

Table 4: Digital Business Engineering Requirements

Figure 1 shows an overview of the Digital Business Engineering Method. It comprises strategic, business process, and system technology aspects, thus providing an integrated approach for addressing both business and IT related design tasks. The method consists of six phases.

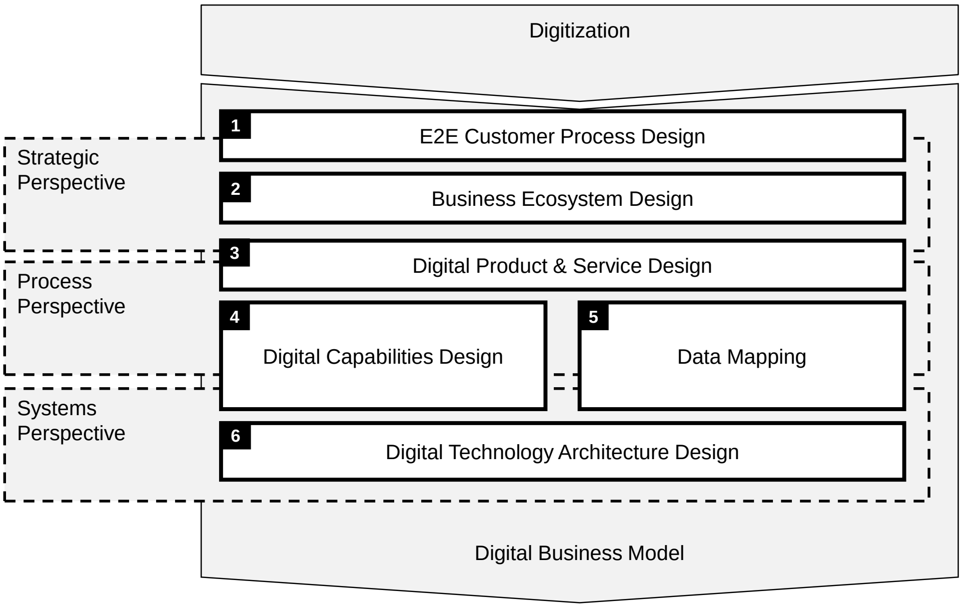

Figure 1: Digital Business Engineering Overview

Phase 1 analyses the end-to-end customer process, which forms the ultimate starting point for digital business modelling. It is based on findings from research and practice that a key success factor in the digital economy is a comprehensive understanding of the future customer process, instead of focusing on optimizing the traditional customer-supplier interaction points. Phase 2 aims at understanding and designing the business ecosystem that must be in place to support the end-to-end customer process in a comprehensive way.

Phase 3 deals with the design of digital products and services needed in the support of the customer process. Yoo et al. (2010), for example, propose a general architecture for digital artefacts.

It is evident that digital products and services rely on organizational capabilities, which are subject of Phase 4. Digital capabilities are dynamic capabilities, which allow rearranging enterprise resources in order to make use of the digitization.

Furthermore, digital artefacts (as a generic term for both digital products and services) require data of various kinds and from various sources. Otto et al. (2014), for example, analyse cases of the networked economy with regard to the data variety. Data can come from internal or external sources, be under the organization's or under third-party ownership, be in different data quality, occur in streams or in batches, follow a certain schema or be unstructured.

Thus, Phase 5 deals with data mapping making sure that the business objects required in the end-to-end customer process are transparent and that corresponding data objects are identified and described (including their format, occurrence, and source, for example). Finally, Phase 6 of Digital Business Engineering designs the digital technology architecture. Table 5 shows the components of the Digital Business Engineering Method, namely the goals, involved roles and techniques for all six phases.

Section 4.2 introduces selected method components, in particular techniques, as they were applied in the case studies. The entire method was not applied in full in any of the cases. However, the design research processes aggregates the findings of the five cases into a comprehensive methodological framework.

DBE Phase	Description	Goal	Involved Roles	Techniques
1	E2E Customer Process Design	Understand end-to-end customer process from an outside view	Business Development, Sales, Marketing	Customer Journey Analysis, Customer Process Modelling, Multi-Channel Analysis
2	Business Ecosystem Design	Understand actors within customer process and customer interaction points	Business Development, Sales, Marketing, Product Development	SWOT Analysis, Network Analysis
3	Digital Product and Service Design	Design digital products and services based on end-to-end understanding of customer process	Business Development, Sales, Marketing, Product Development	Business Model Canvas, Digital Artefact Design, Design Thinking
4	Digital Capabilities Design	Identify capabilities needed to provide digital products and services	Business Development, IT, Product Development	Capability Reference Model
5	Data Mapping	Identify data assets needed to provide digital products and services	Business Development, IT, Data Management, Product Development	Data Architecture Management, Data Mapping, Data Value Chain
6	Digital Technology Architecture Design	Design digital technology architecture	Data Management, IT	Digital Architecture Management
Legend: DBE - Digital Business Engineering; E2E - End-to-End; SWOT - Strengths, Weaknesses, Opportunities, Threats; IT - Information Technology.				

Table 5: Digital Business Engineering Method Components

4.2 Method Components

4.2.1 Customer Journey Analysis

Figure 2 shows the first version of an end-to-end customer design technique used in Case D for the scenario “life insurance”.

Internally coined as “customer journeys” the technique takes an outside-in perspective to the company. The process starts with the customers’ need for information and ends with an electronic invoice. Throughout the entire process, various digital technologies (e.g. social media, chats, digital signature) are deployed across multiple channels (e.g. Internet, e-mail, telephone, chats, communities).

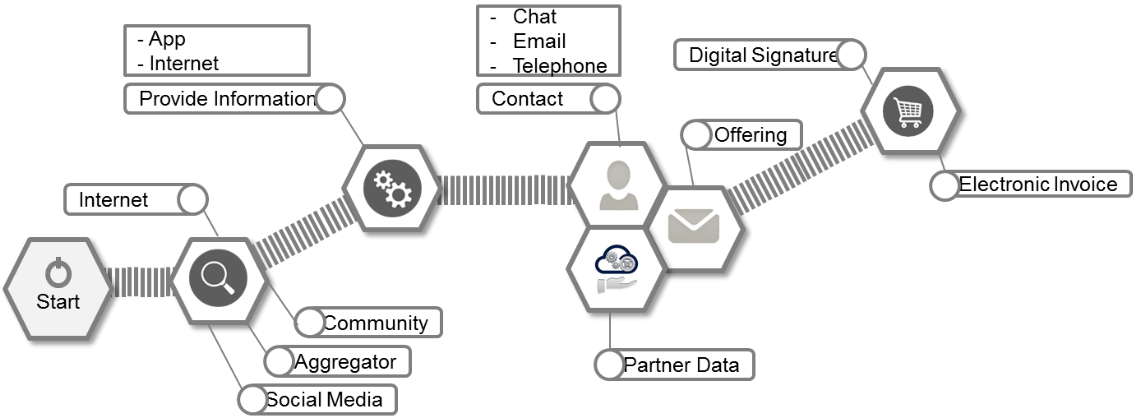

Figure 2: End-to-End Customer Design in Case D

4.2.2 Multi-Channel Analysis

Figure 3 shows the use of Multi-Channel Analysis in Case B. The company used the technique to analyse the relationship between the customer process and the various interaction channels the company offers to the customer. The analysis shows that the general customer process includes nine steps, starting with information about a certain product and ending with service activities on the purchased product. Of course, not all steps are relevant in the traditional food division, but occur very often in the electronics division, which offers consumer electronics such as television sets, computers etc. In addition, nine channels exist through which interaction with the customer takes place.

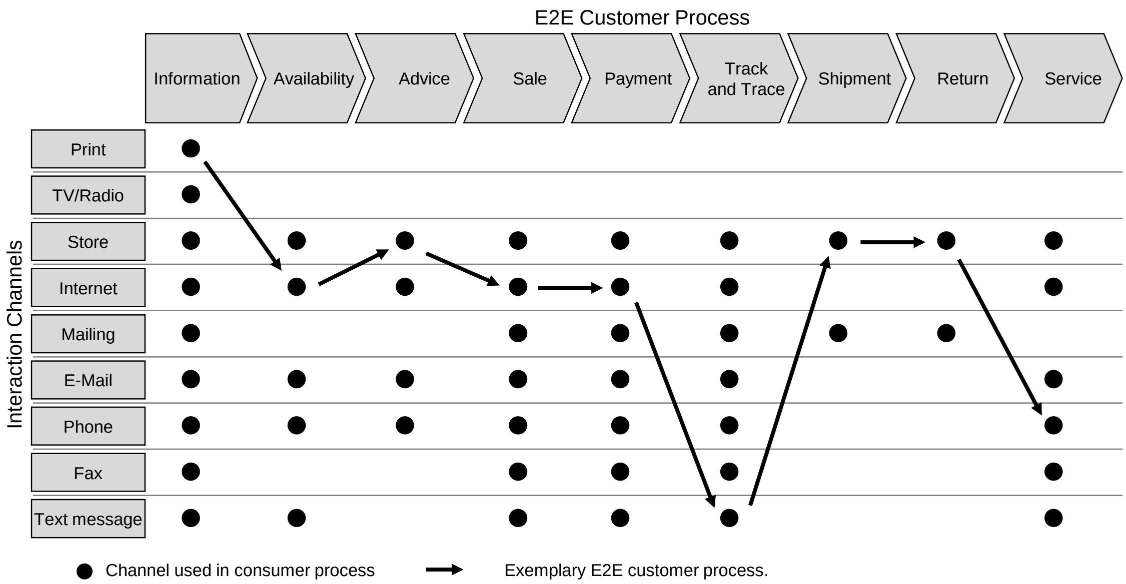

Figure 3: Multi-Channel Analysis in Case B

A typical "path" across the various channels is as follows: A customer receives information about a new TV product via printed advertisements. If interested, he/she checks availability of the particular product via the company's internet shop. The customer then goes into a store in order to have a look at the product (as a TV is a relatively expensive item). He seeks advice from a store employee, but purchases and pays the product over the internet. When the product is available, he receives a text message on his mobile phone. The customer picks up the item in the store and might, in case something is wrong with it, also return it there. Service claims are then handled over the phone. In Case B, the multi-channel analysis was used for achieving understanding of the customer process, but mainly for making sure that information about the products (e.g. product features, availability, price etc.) is provided consistently across the different interaction channels.

4.2.3 Network Analysis

Figure 4 shows the result of a business ecosystem analysis in Case A. The technique was used in the preparation phase of establishing a digital business responsibility in the company. The focus is on how product information is created, used and distributed through the company's ecosystem. Product information comprises standard data such as product name, content, manufacturer information, and GTIN (Global Trade Identification Number), "value-added" information on allergen sensibility, ingredients, "how-to-apply" and "where to buy" information etc.

The technique used network analysis to illustrate the "betweenness centrality" of the various actors in the ecosystem when it comes to controlling the flow of product information. Betweenness centrality equals the number of shortest paths from all notes on the ecosystem to all others that pass through that node. A node with high betweenness centrality has a large influence on the transfer of product information, thus, is considered most powerful (cf. Wasserman and Faust 1994).

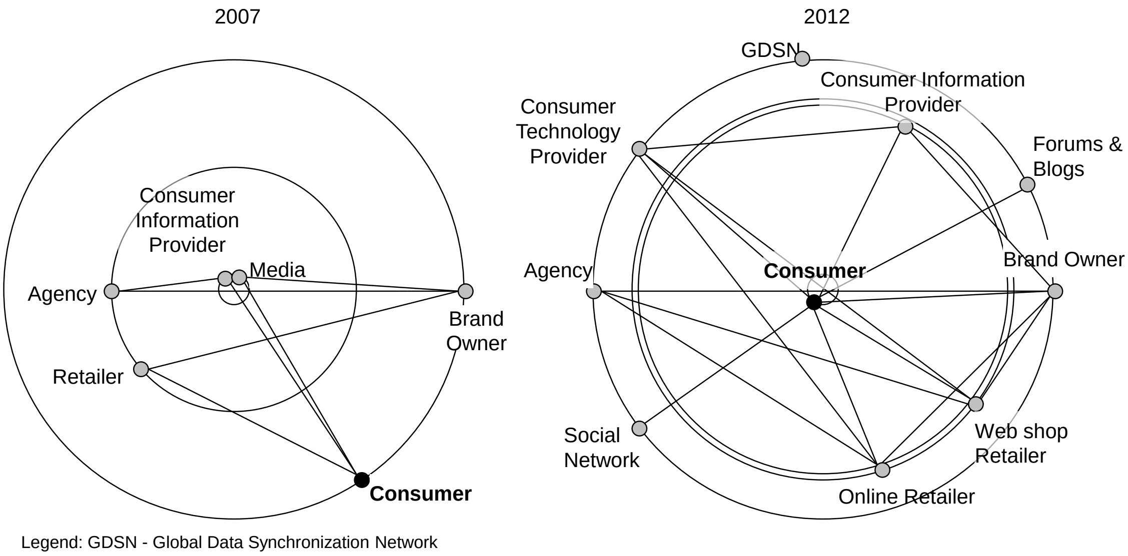

Figure 4: Business Ecosystem Analysis in Case A

The analysis was conducted with experts from the marketing, supply chain, sales and data management departments in Case A. Participants were asked to describe the ecosystem and the flow of product information through the ecosystem. They were asked to reflect on the current situation (2012) and five years ago. All paths are considered equally important, i.e. no weighing was applied.

Results of the analysis were twofold. First, the number of actors in the ecosystem has increased from six to ten, i.e. the ecosystem became more complex. Second, the betweenness centrality changed. While the "brand owner" (the company in Case A) remained on the outer circles with a low value of betweenness centrality, the consumer gained much more power and moved from the periphery to the centre of the ecosystem.

4.2.4 Data Mapping

Figure 5 shows the data map for digital services in Case E. The company operates in a direct sales and services model, thus, the data map is centred on data about products and services.

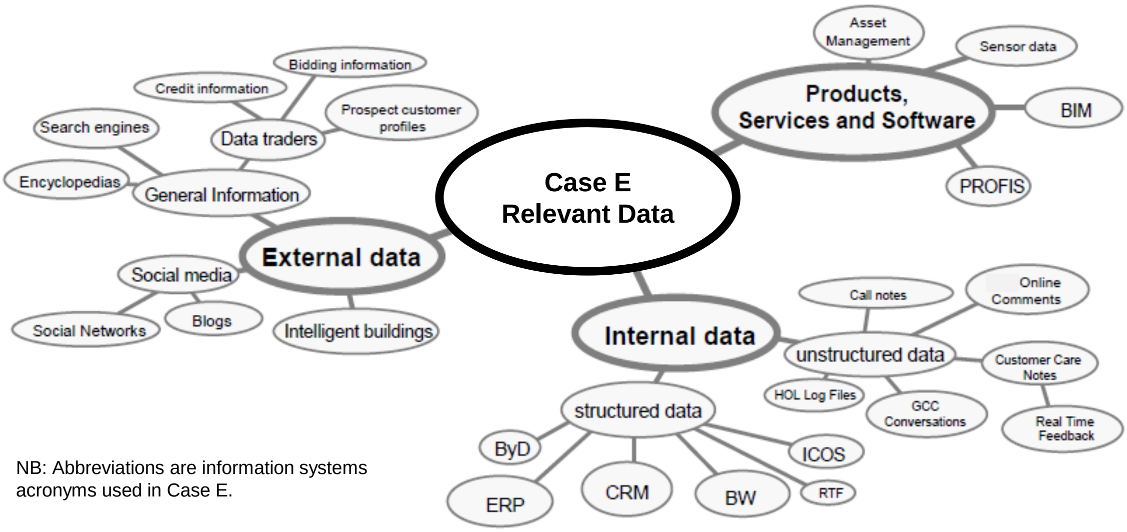

Figure 5: Data Mapping in Case E

In addition to these data, digital services use various internal data sources, both structured and unstructured. Structured data comes mainly from large enterprise information systems such as ERP and CRM whereas unstructured data comes from call centre activities, for example. A third data domain is external data, which comes from various sources such as data traders and social networks.

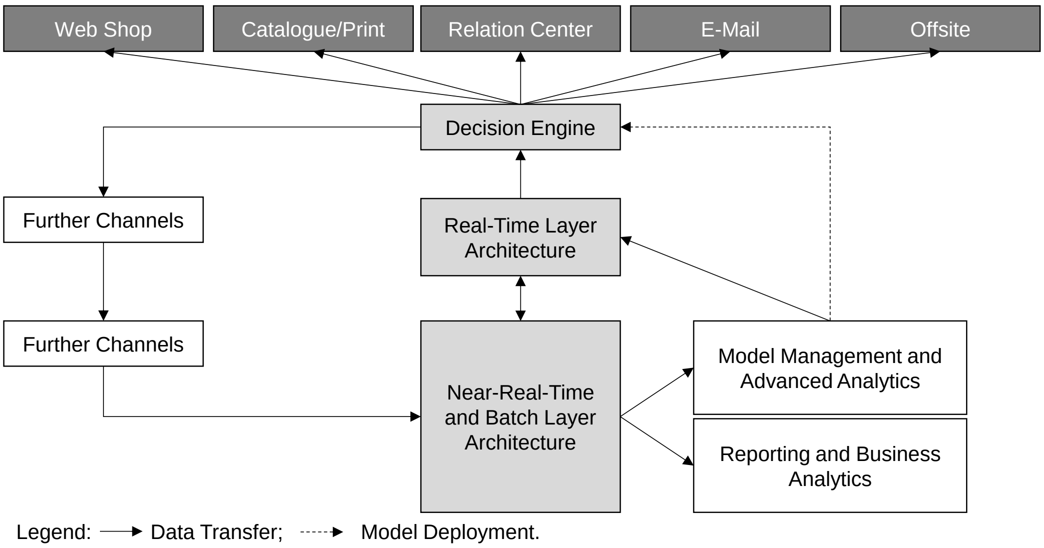

Figure 6: Digital Technology Architecture in Case C

4.2.5 Digital Technology Architecture Design

Figure 6 shows the digital technology architecture in Case C. The online fashion retailing business requires decision making in almost real-time. For example, if a customer is likely to stop a purchasing activity, the digital technology architecture helps with customer churn prevention in real-time.

Three components form the digital technology architecture, namely the decision-engine that is fed by mathematical and statistical models about customer behaviour. The real-time layer architecture is capable of analysing online shopping data. The near-real-time and batch layer architecture processes information about wish lists, customer master data etc.

The architecture design follows the requirements of the company's digital business model including multi-channel management and digital service design.

5 Findings from Method Application in the Field

Using the method in the field led to a number of findings with regard to model design and its usefulness with regard to current barriers to digital business model development.

First, the method facilitates the business modelling process as it provides a common language between multiple stakeholders from various departments in a company. For example, in Cases A and D the method components guided the activities in which employees from marketing, IT, business development, supply chain management etc. were involved.

Second, the method helps to stay focussed on the customer perspective. Often, in the course of the digital business design processes, employees tend to concentrate on the existing customer interaction. In particular, the customer journeys in Case C helped to keep the outside-in perspective.

A third finding relates to the issue of appropriate organisational structures. As pointed out by Brown and Sikes (2012), applying the method requires a clear mandate for action. In Case A, however, it was unclear whether marketing or sales were leading the digital business transformation initiative. The Digital Business Engineering method helped to structure the activities needed. However, the full potential could not have been reached.

Fourth, the method needs refinement as in its present form it focuses on digital business. However, enterprises are unable of simply switching from traditional to digital business. A big challenge in all cases stemmed from the fact that the traditional business model must be kept while at the same time digital business transformation must be driven forward. That is why the company in Case D was not only developing customer journeys, but also "employee journeys" to make explicit the need for organizational change during digital transformation.

Sixth, the method needs further development in order to be able to cope with different levels of digital business maturity. For example, in Case A it turned out that the sales organisation in the United Kingdom was much more advanced in terms of digital business compared to the markets in Germany and Switzerland.

Finally, Digital Business Engineering takes an enterprise perspective, but leads to individual digital products and services. It does not answer the question, though, how experiences from one area can be transferred (our scaled) across the rest of the enterprise.

6 Conclusions

6.1 Result and Contribution

The research presented in this paper addresses a gap in literature as well as in practice. Both communities observe a lack in methodological support in designing digital business models. Digital Business Engineering is proposed as a method for digital business model design. The paper contributes to the scientific body of knowledge as it is among the first research results that identifies guidelines needed for digital business transformation. The method embodies both scientific knowledge and knowledge from the practitioners' community. It is an artefact which instantiates the general principles for digital business design methods. The method is beneficial for practitioners. In particular, the participative case studies showed that Digital Business Engineering is useful in "real-life" situations.

6.2 Limitations and Outlook to Future Research

Qualitative research in general is limited with regard to validity and generalizability. The research uses five cases and focus group interviews for analysing the requirements and evaluating the method. The paper illustrates the method through describing and analysing the application of method components in the five cases. Further research is needed to validate the structure of the method, the method components and their relationships, e.g. through a more rigorous case analysis (within case and cross-case). Apart from that, the method was not applied in full in any of the five cases. All components were used at least once, but not in one comprehensive case. Thus, the usefulness and applicability of the method as a whole has not been evaluated yet, as well as the efficacy of the method. Apart from that, the method components are to some extent immature and need refinement. One example is the lack of conceptual depth of a meta-model. The method in its current form is a result of a first design iteration. Future research activities should include incorporating the results of the focus groups into the next design iteration.

Further research opportunities lie also in the identification of general design principles for digital business methods, which could then form the foundation of a design theory for this particular domain.

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